

This listing of claims will replace all prior versions, and listings of claims in the application:

**Listing of Claims:**

Claim 1. (Currently Amended) A method of producing propylene from ethane comprising the steps of:

- a. steam cracking an ethane or primarily ethane feedstock thereby producing a cracking product containing ethylene, hydrogen, ethane, methane, acetylene and C<sub>3</sub> and heavier hydrocarbons;
- b. treating said cracking product in an ethylene plant recovery section including removing said hydrogen, methane and C<sub>3</sub> and heavier hydrocarbons therefrom and converting said acetylene therein primarily to ethylene to thereby produce a treated cracking product containing primarily ethylene and ethane and including fractionating said treated cracking product in a C<sub>2</sub> fractionator and obtaining an ethylene fraction of chemical grade ethylene having an ethylene content of less than 99% by volume and a bottoms ethane fraction;
- c. recycling said bottoms ethane fraction to said steam cracking;
- d. reacting by dimerization in a dimerization section a first portion of said ethylene fraction thereby producing a butene-rich stream containing heavier hydrocarbons, ethylene and ethane;
- e. separating said heavier hydrocarbons in a ~~butane~~ butene separator from said butene-rich stream and feeding the remaining butene-rich stream containing ethylene, ethane and butene to said metathesis section;
- f. reacting by metathesis in said metathesis section the butene in said butene-rich stream with a second portion of said

- ethylene fraction thereby producing a propylene-rich stream containing propylene, ethylene and ethane;
- g. separating propylene from said ethylene and ethane in said propylene-rich stream, and
  - h. recycling at least a first portion of said ethylene and ethane from said propylene-rich stream to said C<sub>2</sub> fractionator.

Claim 2. (Previously Amended) A method as recited in claim 1 wherein separation of said propylene from said ethylene and ethane in said propylene-rich stream takes place in a metathesis section deethanizer.

Claim 3. (Previously Amended) A method as recited in claim 2 wherein a second portion of said ethylene and ethane separated from propylene in said metathesis section deethanizer is condensed and returned to said metathesis section deethanizer as reflux.

Claim 4. (Canceled)

Claim 5. (Canceled)

Claim 6. (Previously Amended) A method as recited in claim 1 wherein a portion of said ethylene and ethane is removed from said butene-rich stream in a dimerization section deethanizer.

Claim 7. (Previously Amended) A method as recited in claim 6 wherein a first part of said portion of ethylene and ethane removed from said butene-rich stream is recycled to said dimerization section and a second part is purged and recycled to said ethylene plant recovery section.

Claim 8. (Previously Amended) A method as recited in claim 7 wherein said second part of said ethylene and ethane removed from said butene-rich stream is recycled to said C<sub>2</sub> fractionator.

Claim 9. (Canceled)

Claim 10. (Canceled)

Claim 11. (Previously Amended) A method as recited in claim 2 wherein all of said ethylene and ethane removed from said propylene-rich stream in said metathesis section deethanizer is recycled directly to said C<sub>2</sub> fractionator.

Claim 12. (Previously Amended) A method as recited in claim 11 wherein a third portion of said ethylene fraction from said C<sub>2</sub> fractionator is fed to said metathesis section deethanizer as reflux.

Claim 13. (Canceled)

Claim 14. (Previously Amended) A method as recited in claim 1 wherein the deethanized propylene-rich stream from metathesis contains butene and other C<sub>4</sub> and heavier hydrocarbons and wherein said butene and other C<sub>4</sub> and heavier hydrocarbons are separated therefrom and fed to said butene separator in said dimerization section.

Claim 15. (Canceled)

Claim 16. (Previously Amended) A method as recited in claim 46 wherein a second portion of said ethylene and ethane separated from said propylene-rich stream in said metathesis section deethanizer is condensed and returned to said metathesis section deethanizer as reflux.

Claim 17. (Canceled)

Claim 18. (Canceled)

Claim 19. (Previously Amended) A method as recited in claim 46 wherein a third portion of said chemical grade ethylene fraction from said C<sub>2</sub> fractionator is fed to said metathesis section deethanizer as reflux.

Claim 20. (Canceled)

Claim 21. (Previously Amended) A method as recited in claim 46 wherein the deethanized propylene-rich stream from metathesis contains butene and other C<sub>4</sub> and heavier hydrocarbons and wherein said butene and other C<sub>4</sub> and heavier hydrocarbons are separated therefrom and fed to said butene separator in said dimerization section.

Claim 22. (Canceled)

Claim 23. (Canceled)

Claim 24. (Canceled)

Claim 25. (Previously Amended) A method as recited in claim 46 wherein all of said ethylene and ethane removed from said propylene-rich stream in said metathesis section deethanizer is recycled to said C<sub>2</sub> fractionator.

Claim 26. (Canceled)

Claim 27. (Canceled)

Claim 28. (Canceled)

Claim 29. (Original) A method as recited in claim 1 wherein said ethane or primarily ethane feedstock comprises a mixed ethane/propane feedstock containing at least 70% ethane.

Claim 30. (Canceled)

Claim 31. (Canceled)

Claim 32. (Canceled)

Claim 33. (Canceled)

Claim 34. (Previously Amended) A method as recited in claim 1 where additional propylene product is obtained from unsaturated C<sub>3</sub>'s produced in the steam cracker.

Claim 35. (Previously Amended) A method as recited in claim 1 wherein an additional ethylene fraction is obtained in said step of fractionating said treated cracking product and wherein said additional ethylene fraction is a polymer grade ethylene product having an ethylene content greater than 99% by volume.

Claim 36. (Canceled)

Claim 37. (Canceled)

Claim 38. (Canceled)

Claim 39. (Canceled)

Claim 40. (Previously Amended) A method as recited in claim 1 wherein said butene for reaction in said metathesis section further comprises butene recovered from said heavier hydrocarbons in said cracking product.

Claim 41. (Previously Amended) A method as recited in claim 1 wherein said butene for reaction in said metathesis section further comprises butene from a source selected from refinery processes and the catalytic dehydrogenation of butanes.

Claim 42. (Previously Amended) A method as recited in claim 1 wherein said ethylene fraction has an ethylene content of 90-95 %.

Claim 43. (Previously Amended) A method as recited in claim 45 wherein said chemical grade ethylene fraction has an ethylene content of 90-95%.

Claim 44. (Previously Amended) A method as recited in claim 14 wherein said ethane or primarily ethane feedstock comprises a mixed ethane/propane feedstock containing at least 70% ethane.

Claim 45. (Currently Amended) A method of producing propylene from ethane comprising the steps of:

- a. steam cracking an ethane or primarily ethane feedstock thereby producing a cracking product containing ethylene, hydrogen, ethane, methane, acetylene and C<sub>3</sub> and heavier hydrocarbons;
- b. treating said cracking product in an ethylene plant recovery section including removing said hydrogen, methane and C<sub>3</sub> and heavier hydrocarbons therefrom and converting said acetylene therein primarily to ethylene to thereby produce a treated cracking product containing primarily ethylene and

- ethane and including fractionating said treated cracking product in a C<sub>2</sub> fractionator and obtaining a chemical grade ethylene fraction having an ethylene content of less than 99% by volume, a polymer grade ethylene fraction having an ethylene content of at least 99.5% by volume, and a bottoms ethane fraction;
- c. recycling said bottoms ethane fraction to said steam cracking;
  - d. reacting by dimerization in a dimerization section a first portion of said chemical grade ethylene fraction thereby producing a butene-rich stream containing heavier hydrocarbons, ethylene and ethane;
  - e. separating said heavier hydrocarbons in a ~~butane~~ butene separator from said butene-rich stream and feeding the remaining butene-rich stream containing ethylene, ethane and butene to said metathesis section;
  - f. reacting by metathesis in said metathesis section the butene in said butene-rich stream with a second portion of said chemical grade ethylene fraction thereby producing a propylene-rich stream containing propylene, ethylene and ethane;
  - g. separating propylene from said ethylene and ethane in said propylene-rich stream, and
  - h. recycling at least a first portion of said ethylene and ethane from said propylene-rich stream to said C<sub>2</sub> fractionator.

Claim 46. (Previously Amended) A method as recited in claim 45 wherein separation of said propylene from said ethylene and ethane in said propylene-rich stream takes place in a metathesis section deethanizer.

Claim 47. (Canceled)

Claim 48. (Previously Added) A method as recited in claim 45 wherein said ethane or primarily ethane feedstock comprises a mixed ethane/propane feedstock containing at least 70% ethane.

Claim 49. (Previously Added) A method as recited in claim 45 where additional propylene product is obtained from unsaturated C<sub>3</sub>'s produced in the steam cracker.